1.Register is a
A. Set of capacitors used to register input instructions in a digital computer
B. Set of paper tapes and cards put in a file
C. Temporary storage unit within the CPU having dedicated or general purpose use
D. Part of the auxiliary memory

## Answer ||| C

Solution ||| Register is a temporary storage unit within the CPU having dedicated or general purpose use.
2.In which district of Madhya Pradesh Swami Dayanand Saraswati opened the branch of Arya Samaj?
A. Satna
B. Khandwa
C. Raisen
D. Bhopal

Answer ||| B

Solution ||| In Madhya Pradesh Branch of Arya Samaj was opened by Swami dayanad Saraswati in Khandwa district.
3.Jallianwala Bagh Massacre of Madhya Pradesh was took place at?
A. Gwalior
B. Bhopal
C. Chattarpur
D. None of these

Answer ||| C

Solution ||| The Jallianwala Bagh Massacre of Madhya Pradesh also known as Charan Paduka Massacre, where police opened fire on peaceful meetings of freedom fighters at Chattarpur and killed many innocent persons.
4.What is the full form of 'LAN'?
A. Line Area Network
B. Linear Area Network
C. Local Area Network
D. Land Area Network

## Answer |II C

## Solution |||

- A local-area network (LAN) is a computer network that spans a relatively small area.
- Most often, a LAN is confined to a single room, building or group of buildings, however, one LAN can be connected to other LANs over any distance via telephone lines and radio waves.

5. Which computer language is used in artificial intelligence?
A. PROLOG
B. COBOL
C. LOGO
D. FORTRAN

Answer ||| A

Solution ||| PROLOG is a general-purpose logic programming language associated with artificial intelligence and computational linguistics. There are primarily two computer languages used in artificial intelligence work, LISP and PROLOG. LISP, which is short for List Processing, was created by John McCarthy of Stanford University.
6.Who is known as the 'Father of Email'?
A. Larry Page
B. Alan Turing
C. Raymond Tomlinson
D. Elon Musk

Answer ||| C

Solution |||

- Raymond Tomlinson is considered as the 'Father of Email'.
- He was a pioneering American computer programmer who implemented the first email program on the ARPANET system, the precursor to the Internet, in 1971.
- He is internationally known and credited as the inventor of email.
7.What is the full form of ISDN?
A. International Service Digital network
B. Indian Service Digital Network
C. Integrated Service Digital Network
D. Internal Service Digital Network


## Answer ||| C

Solution ||| ISDN is abbreviated as Integrated Services Digital Network is a set of communication standards for digital telephone connection and simultaneous digital transmission of voice, video, data, and other network services over the traditional circuits of the public switched telephone network.
8. Which among the following is not an input device?
A. Plotter
B. Magnetic Ink Character Recognition (MICR)
C. Optical Mark Recognition (OMR)
D. Barcode Reader
E. None of these

Answer ||| A

Solution |||

- The plotter is not an input device rather it is an output device.
- Instead of toner, plotters use a pen, pencil, marker, or another writing tool to draw multiple, continuous lines onto the paper rather than a series of dots like a traditional printer.
9.Teach Text' is a text editor in which of the following operating systems?
A. Windows
B. Google Chrome
C. Mozilla Firefox
D. Macintosh

Answer ||| D

Solution |||

- The TeachText application is a simple text editor made by Apple Computer and included with Macintosh System 7.1 and earlier.
- It was created by Apple programmer Bryan Stearns with later versions created by Stearns and Francis Stanbach.
- TeachText was one of the only applications included with System 7, leading to its frequent role as the application to open "ReadMe" files.
- It was named "TeachText" as a nod to this role in tutorials and other introductory materials.
10.The web uses the $\qquad$ to request and serve web pages and programs.
A. Hyper Text Marketing Language
B. Hyper Text Markup Language
C. Hotmail Text Markup Language
D. Home Text Markup Language

Answer ||| B

Solution |||

- Hypertext Markup Language (HTML) is the standard markup language for creating web pages and web applications. With Cascading Style Sheets (CSS) and JavaScript, it forms a triad of cornerstone technologies for the World Wide Web.
- Web browsers receive HTML documents from a web server or from local storage and render them into multimedia web pages.
- HTML describes the structure of a web page semantically and originally included cues for the appearance of the document.
11.Using $\qquad$ one can resize, tag digital images, organise pictures into albums by drag and drop, can export the pictures for external use (by e-mail or print).
A. Data Organiser
B. Facebook Organiser
C. Image Organiser
D. Media Organiser


## Answer ||| C

Solution ||| Using image organizer one can resize, tag digital images, organise pictures into albums by drag and drop, can export the pictures for external use (by e-mail or print). Image organizer is a software that is build to organize the image as per requirement and they are of two types automated and manual. Some example of image organizer are digikam and Gnome.
12.Systems running more than one processes concurrently are called
$\qquad$
A. Multiprocessing
B. Multiprogramming
C. Real time
D. Batch processing

## Answer ||| B

Solution ||| Systems running more than one processes concurrently are called as Multiprogramming. A multiprogramming is a parallel processing in which the multiple programs can run simultaneously. Multiprogramming is the allocation of more than one concurrent program on a computer system and its resources. Multiprogramming allows using the CPU effectively by allowing various users to use the CPU and I/O devices effectively. Multiprogramming makes sure that the CPU always has something to execute, thus increases the CPU utilization.
13.Jaldeep Yojana is related to
A. providing food to fishes
B. providing food to fishermen
C. pollution control of waterbodies
D. providing safe drinking water

Answer ||| B

Solution III

Jaldeep yojana is launched by the state of Madhya Pradesh to give or provide nutritious food, education and health facilities to fishermen. The fishermen group includes living families near reservoirs and islands. It started from India Sagar reservoir.
14.In which city of Madhya Pradesh first diagnostic lab is being set up, in which infertility of milch animals will be treated?
A. Bhopal
B. Gwalior
C. Indore
D. Jabalpur

Answer |II

Solution |||

* First diagnostic lab of Madhya Pradesh is being set up in Jabalpur in which infertility of milch animals will be treated.
* This lab will be set up at the Veterinary Hospital in Jabalpur.
* For this, the Mandi Board Bhopal has approved an amount of 2 crore 5 lakhs.

15. Which place does Madhya Pradesh occupy in the implementation of "Jal Jeevan Mission" in India?
A. 1
B. 2
C. 3
D. 4

Answer ||| C

Solution |||

* Madhya Pradesh ranks third in the implementation of "Jal Jeevan Mission" in India.
* Under the mission, in Niwari and Burhanpur districts of Madhya Pradesh, the target is 100 percent coverage by the year 2020-21.
* Similarly, in 2021-22, a total of 7 districts including Bhopal, Datia, Indore, Rajgarh, Morena, Umaria and Narsinghpur will be completely covered.
* A target has been set to cover the remaining districts in the state by the year 2023 under this mission.
* The launch of Jal Jeevan Mission was announced by Prime Minister Narendra Modi on 15 August 2019.
16.In 2021, the Madhya Pradesh government gave administrative approval of Rs 93 crore 75 lakh for the "Bani" (Harbakhedi) medium irrigation project. This project is located in which district of Madhya Pradesh?
A. Sagar
B. Ujjain
C. Dewas
D. Shivpuri

Answer ||| B

Solution |II

* On 9 February 2021, In the cabinet meeting chaired by the Chief Minister Shri Shivraj Singh Chouhan, an administrative sanction of Rs 93 crore 75 lakh was given for the Bani (Harbakhedi) medium irrigation project.
* The project will irrigate 3,050 hectares.
* Harbakhedi village is located in Mahidpur Tehsil of Ujjain district in Madhya Pradesh.
17.Shambhu Dhara Waterfalls are located in which district of Madhya Pradesh?
A. Shivpuri
B. Satna
C. Anuppur
D. Datia

Answer |II C
Solution |||

- The Shambhu Dhara Waterfalls are located in the Anuppur district of Madhya Pradesh.
- The water of these falls meets the Barati Nala, 9 kilometers from the famous pilgrimage of Amarkantak.
- The height of Shambhu Dhara Fall is only 35 meters.

18. Match the List-I (Folk Song) with List-II (Speciality), and select the correct answer using the code given below of the list:

List-I
(Folk Song)
A) Relo Folk song
B) Hardol ki Manoti
C) Choghadiya Faag
D) Bambulia Folk song

List-II
(Speciality)

1) Bravery Song
2) Sung by Male \& Female
3) Religious Song
4) Creation of Isuri

Codes:
A. A-1 B-3 C-2 D-4
B. A-2 B-1 C-4 D-3
C. A-1 B-2 C-4 D-3
D. A-2 B-4 C-1 D-3

Answer ||| B

Solution |||

The correct match:
(Folk Song) (Speciality)

Relo Folk song - Sung by Male \& Female

Hardol ki Manoti - Bravery Song

Choghadiya Faag - Creation of Isuri

Bambulia Folk song - Religious Song
19.When was the Vishwamitra Khel Award started in Madhya Pradesh?
A. 1991
B. 1994
C. 1996
D. 1999

Answer ||| B

Solution |||

* In Madhya Pradesh, the Vishwamitra Award is given for good training in sports.
* The Vishwamitra Award was started in the year 1994 in Madhya Pradesh.

20. Which of the following Lok Sabha Seat of Madhya Pradesh is reserved for Scheduled Castes (SC)?
A. Bhind
B. Dewas
C. Tikamgarh
D. All of the above

Answer ||| D

Solution |||

* The number of Lok Sabha seats in Madhya Pradesh is 29, while the number of Rajya Sabha seats is 11 .
* Out of 29 parliamentary constituencies of Madhya Pradesh, the number of SC and ST parliamentary constituencies are 4 and 6 respectively.
* 4 seats are reserved for SC candidates namely Bhind, Tikamgarh, Dewas and Ujjain, whereas Shahdol, Mandla, Ratlam, Dhar, Khargone and Betul constituencies are reserved for ST.

21. Who among the following is the Speaker of Madhya Pradesh Legislative Assembly?
A. Narendra Kumar Jain
B. Girish Gautam
C. AK Shukla
D. Rajan S. Katoch

Answer ||| B

Solution |||

BJP MLA Girish Gautam was unanimously elected as Speaker of the Madhya Pradesh Assembly on the first day of the State Budget session on February 22, 2021. Chief Minister Shivraj Singh Chouhan moved a proposal in the House to elect Mr. Gautam as the Assembly's Speaker.
22.Madhya Kshetra Vidyut Vitaran Company (MKVVC) is the first power distribution company in the country. MKVVC is located in which city of Madhya Pradesh?
A. Indore
B. Bhopal
C. Vidisha
D. Jabalpur

Answer ||| B

Solution |||

* Madhya Kshetra Vidyut Vitran Company (MKVVC) is located in Bhopal.
* MKVVC is the first power distribution company in the country, in which, the e-office system is being operated from the corporate office to local circle level offices.

23. Which amongst the following sector has been allocated the most financial resources in Madhya Pradesh Budget 2021-22?
A. Health and Family Welfare
B. Social Welfare and Nutrition
C. Agriculture and allied activities
D. Rural Development

Answer ||| C

Solution |II
Of the above-mentioned sectors, Agriculture and allied activities has been allocated the most financial resources in Madhya Pradesh Budget 2021-22 i.e., 16,142 crores ( $8 \%$ more than 2019-20). Some important schemes under the sector includes - Rs 4,592 crore has been allocated to the Atal Krishi Jyoti Yojana and Rs 3,200 crore has been allocated to the Mukhya Mantri Kisan Kalyan Yojana.
24. Which of the following Gharana is known as "the cradle of Hindustani music"?
A. Agra Gharana
B. Kirana Gharana
C. Gwalior Gharana
D. Delhi Gharana

## Answer ||| C

Solution |||

Gwalior Gharana is the cradle of Hindustani music. The Gwalior is one of the oldest Khyal Gharana in Indian classical music. The rise of the Gwalior Gharana started with the reign of the Mughal emperor Akbar (1542-1605). It is one of the oldest with all other gharanas in one way or other being its off shoots. The rivalry between the families of Nathan Peer Baksh and Shakkar Khan led to the migration of the two families to Gwalior.
25.Madhya Pradesh Land Revenue Act was passed in which year?
A. 1956
B. 1959
C. 1949
D. 1952

Answer ||| B

Solution ||| The Madhya Pradesh Land Revenue Act was passed in the year 1959 and this Act extends to the whole districts of Madhya Pradesh. The act tells about the different aspect covers under the Act which is used by the Revenue Officers.
26.In which district of Madhya Pradesh, Asia's largest Soyabean plant was established?
A. Gwalior
B. Jabalpur
C. Bhopal
D. Ujjain

Answer ||| D

Solution ||| The largest plant of Soyabean in Asia is at Ujjain while National Soya bean Research Centre is at Indore. India is Asia's second largest producer of soybeans, and it accounts for 3.95 percent of global production. Ujjain is the fifth largest city in Madhya Pradesh by population.
27. Which is largest (production in MT) cultivated spice in Madhya Pradesh?
A. Coriander seeds
B. Ginger
C. Haldi
D. Garlic

Answer ||| D

Solution |||

Garlic -

* Madhya Pradesh is one of the largest producers of Garlic in India.
* Major varieties grown in Madhya Pradesh are Yamuna Safed-3, Yamuna Safed-4 (G-323), Yamuna Safed-5 (G-189) and Agrifound Parvati-2 (G-408), G-282.
* District that topped in garlic production is Neemuch.
* Estimated production of 18.09 lakhs MT which is highest among all spices produced in the state (Economic Survey of MP 2020-21).
A. It is new agricultural equipment developed by PUSA
B. Arrangement for easy agricultural produce export.
C. This is scheme to attract and retain youth in agriculture.
D. It is agriculture related start up by group of rural youth of MP.


## Answer ||| C

Solution |II

ARYA (Attracting and Retaining Youth in Agriculture), this project helps under-employed and unemployed rural youth in establishing agri-based enterprises by imparting necessary skills and entrepreneurial training in village setting. ARYA is a scheme to provide self-employment to rural youth in agriculture sector through KVK (Kisan Vigyan Kendras).
29.Which of the following activities are part of Rural Welfare activities?
A. Social Welfare Activities
B. Good Governance Activities
C. Human Welfare Activities
D. All of the above

Answer ||| D

Solution ||| Rural Welfare Activities signifies those measures taken to enhance or improve the living conditions of rural population directly or indirectly. Several rural welfare activities are -

1) Social Welfare Activities - Housing, Health, Water, Food Security, etc.
2) Economic Welfare Activities - Employment, Agriculture, Rural Credit, etc.
3) Good Governance Activities - Panchayati Raj, e-governance, etc.
4) Environmental Welfare Activities - addressing Pollution, land degradation, sanitation, etc.
5) Human Welfare Activities - Skill development, Electricity, Roads, etc.
30. What is the percentage of reservation for women in Panchayati Raj Institutions in MP?
A. $75 \%$
B. $25 \%$
C. $50 \%$
D. $33 \%$

Answer ||| C

Solution ||| Panchayati Raj is a local self-government setup which provides democracy to the grassroots and help in establishing Participatory democracy or Co-governance. MP Panchayati Raj Gram Swaraj Adhiniyam, 1993 established 3-tier system with $50 \%$ reservation to women.
31.When was Shram Siddhi Campaign launched in Madhya Pradesh?
A. 22 May 2019
B. 25 Dec 2019
C. 22 May 2020
D. 25 Dec 2020

Answer ||| C

Solution ||| On 22 ${ }^{\text {nd }}$ May 2020, Madhya Pradesh CM started a campaign in every panchayat of the state to provide job cards to rural labourers. These Job cards helps in getting suitable jobs as per person's merit \& skills.
32. Which one of the following committees does not belong to Panchayati Raj Institutions?
A. Balwant Rai Mehta Committee
B. Ashok Mehta Committee
C. L. M. Singhvi Committee
D. P. V. N. Rao Committee

Answer ||| D

Solution |||

- PV Narasimha Rao was the 9th Prime Minister of India from 1991 to 1996. He is known for bringing the policy of economic liberalisation in India. The economic liberalisation in India is referred to the liberalisation of the country's economic policies. It was initiated in 1991 with the goal of making the economy more market- and service-oriented, and expanding the role of private and foreign investment.
- L M Singhvi Committee takes the Indian villages and the Gram Sabha as the republican base of our democratic nation. It considers the Gram Sabha as the embodiment of direct democracy. It has recommendations on Nyaya Panchayats and integrated administrative structures.
- Janata Government in Dec 1977 appointed a committee on Panchayati Raj institutions under the chairmanship of Ashok Mehta. In its report submitted in August 1978, it made 132 recommendations to revive and strengthen the declining Panchayati Raj system in the country.
- Balwant Rai Mehta Committee was appointed by Government of India (GoI) in the year 1957 to examine the working of the CDP and NES and to suggest measures for their better performance.
33.The largest canal of India is
A. Indira Gandhi Canal
B. Rajiv Gandhi Canal
C. Sanjay Gandhi canal
D. Deen Dayal Upadhyay Canal


## Answer ||| A

Solution ||| The correct answer is option A, i.e., Indira Gandhi Canal. With a length of 650 km, Indira Gandhi Canal is the largest irrigating canal of India. It starts from Harike Barrage in Punjab and its major portion lies in Rajasthan. Originally, it was called as Rajasthan Canal.
34. Medium Irrigation Schemes have the cultivable command area
A. Less than 3000 hectares
B. Between 3000 and 15000 hectares
C. Between 2000 and 10000 hectares
D. Less than 2000 hectares

Answer ||| C

Solution ||| The correct answer is option C, i.e., between 2000-10000.
India's ultimate irrigation potential has reached 140 Mha which comprises 58.5 Mha from major and medium schemes, 15 Mha from minor irrigation schemes and 66 Mha from groundwater exploitation. Major Irrigation Schemes have Cultivable Command Area (CCA) greater than 10,000 hectares. Medium Irrigation Schemes have cultivable command area between 2000-10,000 hectares. Minor Irrigation Scheme have Cultivable Command Area (CCA) less than 2000 hectares.
35.Culture and Tourism Minister Prahlad Singh Patel has organised Flag Satyagraha programme in which place?
A. Bhopal, Madhya Pradesh
B. Lucknow, Uttar Pradesh
C. Jabalpur, Madhya Pradesh
D. Indore, Madhya Pradesh
E. Varanasi, Uttara Pradesh

## Answer ||| C

Solution |||

- Culture and Tourism Minister Prahlad Singh Patel has organised Flag Satyagraha programme in Jabalpur, Madhya Pradesh.
- The programme was organised by Union Culture Ministry and IGNCA as part of Azadi Ka Amrit Mahotsav to commemorate 75 years of Country's independence.
- It reminisces the historic moments of Jhanda Satyagraha held in Jabalpur in 1923 when the immortal martyrs first unfurled the flag at the Town Hall with great courage.
36.The National Skill Development Corporation (NSDC) announced a partnership with which social media platform to launch the 'Digital Skill Champions Program' to train youth on digital skills, and make them employment ready?
A. Facebook
B. Instagram
C. WhatsApp
D. Telegram
E. LinkedIn


## Solution |||

- The National Skill Development Corporation (NSDC) has announced a tie-up with global digital platform, WhatsApp, to launch the 'Digital Skill Champions Program' to train youth on digital skills, and make them employment ready.
- NSDC is an apex body to manage Central backed Skill India or the National Skills Development Mission of India campaign.
- Through this partnership, WhatsApp aims to enhance the digital skills of aspiring entrepreneurs and empower the youth of India to create a safe digital environment for all.
- As part of WhatsApp Digital Skills Academy, youth from Tier-III \& Tier-IV cities will be trained on critical aspects of digital safety and online privacy.
- The initiative will be started on a pilot basis across 50 campuses in 5 states Rajasthan, Madhya Pradesh, Andhra Pradesh, Tamil Nadu and Karnataka.
- The programme will be imparted through WhatsApp's project implementation partner - InfiSpark.
37.Central govt has inaugurated Asia's longest high-speed track - NATRAX in which state?
A. Karnataka
B. Madhya Pradesh
C. Uttar Pradesh
D. Gujarat
E. Maharshtra

Answer ||| B

Solution |||

- Asia's longest high-speed track — NATRAX - was inaugurated at Pithampur near Indore in Madhya Pradesh by Union Minister Prakash Javadekar.
- NATRAX, one of the state-of-the-art automotive testing and certification centre under NATRiP.
- It is a flagship project of the Ministry of Heavy Industries, planned under the Automotive Mission Plan launched by the Centre.
- The longest speed track by NATRAX has a total of 10 tracks, designed keeping in mind to test vehicles in every possible terrain condition.
38.In which part of Madhya Pradesh, the Parivrajak Dynasty was ruling over?
A. Panna
B. Malwa
C. Vidisha
D. Tripuri

Answer ||| A

Solution |||

Parivrajak Dynasty was a regional dynasty of Madhya Pradesh ruling contemporarily to the Gupta Empire. Panna region of Madhya Pradesh constituted their area of dominance.
39. Who among the following foreign traveller described Madhya Pradesh as the 'Land of Brahmins'?
A. Fa-Hien
B. Huen Tsang
C. I-tsing

## D. Abdur Razzak

Answer ||| A

Solution |II

Chinese traveller Fa-Hien visited during Chandragupta Vikramaditya of Gupta dynasty. He described Madhya Pradesh as the 'Land of Brahmins' after viewing the persistent local life.
40.In which of the following inscriptions of Madhya Pradesh, the first evidence of Sati Pratha was found?
A. Mandsaur Inscription
B. Temun Inscription
C. Malwa Inscription
D. Eran Inscription

Answer ||| D

Solution |||

Eran Inscription in Sagar provides the first evidence of Sati Pratha in the country. In this Inscription, Samudragupta is compared to Kuber and Yamraj.
41.In which region of the Madhya Pradesh, Oulikar dynasty ruled?
A. Tripuri
B. Vidisha
C. Bundelkhand
D. Malwa

Answer ||| D

Solution |||

Oulikar Dynasty ruled from $4^{\text {th }}$ Century AD from Malwa region.

The important rulers of this dynasty were- Narverman, Singhverman, Jayverman, Bahuverman
42. Which of the following Mahajanapdas are related to Madhya Pradesh?
A. Chedi and Rajgriha
B. Chedi and Avanti
C. Avanti and Koshal
D. Vatsa and Ashmak

Answer ||| B

Solution |||

Chedi and Avanti are the Mahajanapadas associated to Madhya Pradesh.

Chedi Mahajanapad had its capital at Suktimati, while Avanti had two capitals namely Ujjaini (for Northern part) and Mahishmati (for Southern part).

## 43. Who amongst the following is the present governor (August 2021) of the state of Madhya Pradesh?

A. Shri Mangubhai C. Patel
B. Mr. K.C. Reddy
C. Shri Niranjan Nath Wanchoo
D. Mr. Bhagwat Dayal Sharma

Answer ||| A

Solution |||

The Present Governor of Madhya Pradesh is Shri Mangubhai C. Patel.
Before assuming office, the Governor is administered an oath by the Chief Justice of the High Court affirming to protect and defend the Constitution and to devote himself to the service and well-being of the people.
44.The total number of seats in Madhya Pradesh Legislative Assembly (Vidhan Sabha) is
A. 195
B. 230
C. 280
D. 342

Answer ||| B

Solution |||

The Lower House of Madhya Pradesh is called Vidhan Sabha and it has 230 members, out of which, all members are directly elected from single-seat constituencies.
45. Which district of Madhya Pradesh has become the largest summer moong producing district in the country?
A. Ratlam
B. Vidisha
C. Hoshangabad
D. Jhabua

Answer ||| C

Solution III

Hoshangabad district has once again made a record in producing summer moong. Also, Hoshangabad has become the largest summer moong producing district in the country.
46. Which scheme has been made by the government to promote AYUSH in Madhya Pradesh and to link it with employment?
A. 'Devaranya' scheme
B. Pradhan Mantri Matru Vandana Yojana
C. Hariyali scheme
D. Teerth scheme

## Answer ||| A

Solution III

In order to promote AYUSH in Madhya Pradesh and to link it with employment, the government has made the 'Devaranya' scheme. The scheme has been made to provide employment to the people living in the tribal areas of the state. A complete value chain for the production of AYUSH medicines will be developed in the state through Devarnya Yojana.
47. Which of the following cities of Madhya Pradesh, have been selected by UNESCO under 'Historic Urban Landscape Project'?
A. Bhopal and Ratlam
B. Jhansi and Bhind
C. Gwalior and Katni
D. Gwalior and Orchha

Answer ||| D

## Solution |||

In Madhya Pradesh, Gwalior and Orchha cities have been selected by UNESCO under 'Historic Urban Landscape Project', which was started in the year 2011, for the inclusive and well-planned development of fast-growing historical cities while preserving the culture and heritage.
48. Which state govt has launched Mukhyamantri Awasiya Bhu-dhikar Yojana, the state government will provide plots of land to families who do not have land to build their homes?
A. Uttar Pradesh
B. Madhya Pradesh
C. Rajasthan
D. Uttarakhand
E. Bihar

Answer ||| B

Solution |||

* Under Mukhyamantri Awasiya Bhu-dhikar Yojana, the state government will provide plots of land to families who do not have land to build their homes.
* The construction of houses comes under Pradhan Mantri Awas Yojana
* To ensure that every family has the right to a dignified life with basic necessities.
* Family should consist of a married couple and their unmarried children, and families living in a particular village are eligible.
* For residential plot, the application must be submitted through online SAARA Portal
* The eligible applications will be given ownership rights in joint names of husband and wife

49. Which state government has decided to set up a tax plan for "cow welfare" in the State?
A. Maharashtra
B. Uttara Pradesh
C. Madhya Pradesh
D. Karnataka
E. Himachal Pradesh

Answer ||| C

Solution |||

- Shivraj Singh Chouhan Government has decided to set up a tax plan for "cow welfare" in the State where gau kalyan (cow welfare) has been at the heart of politics for years.
- It has planned to impose surcharge on services provided by local bodies in order to generate Rs 100 crore for meeting the expenses of running cow shelters in Madhya Pradesh.
- It also asked that, cow products should be promoted and cow phenyl should be used across Government offices.

50. Which state government has approved the proposal to create cyber tehsils in the state?
A. Karnataka
B. Telangana
C. Madhya Pradesh
D. Uttar Pradesh
E. Haryana

Answer ||| C

Solution |||

* Madhya Pradesh Cabinet has approved the proposal to create cyber tehsils in the state of Madhya Pradesh
* After this, MP will become the first state in the country to have a cyber tehsil.
* Cyber Tehsil will make the mutation process easy and people from anywhere in the state can avail of its benefit.
* With this, process of conversion will become convenient in the cases of undisputed land.

51. What should be the minimum superelevation for drainage purpose if design speed is 80 kmph and radius of horizontal curve is 250 meters.
A. 0.113
B. 0.067
C. 0.07
D. 0.03

## Answer ||| C

Solution |II

Minimum superelevation provides for drainage purpose
$e=\frac{(0.75 v)^{2}}{g R}$

Where, $v \rightarrow$ design velocity and
$R \rightarrow$ radius of horizontal curve
$e=0.75 \times \quad \mathrm{v}=80 \times \frac{5}{18} \mathrm{~m} / \mathrm{sec}$

So, minimum superelevation

$$
\mathrm{e}=\frac{(0.75 \times 22.22)^{2}}{9.81 \times 250}
$$

$e \Rightarrow 0.113$

But max superelevation should be
$e_{\text {max }}=0.07$

So, we provide 0.07 super revelation.
52.The permissible maximum deflection of a purlin of 7.5 m which is subjected to live load supporting GI metal sheet and supported by elastic cladding-
A. 25 mm
B. 50 mm
C. 41.67 mm
D. 30 mm

## Answer ||| B

Solution |||
Vertical Deflection limits for industrial building's asper IS 800-
a) For purlins and girts subjected to live load/wind load supported on elastic cladding maximum deflection is limited span/150
b) For purlins and girts subjected to live load/wind load supported on brittle cladding maximum deflection is limited span/180

53.For a sand of uniform spherical particle, the ratio of void ratio in the loosest and the densest state is
A. 2.6
B. 0.35
C. 4.6
D. 3.0

Answer ||| A

Solution |II

Void ratio: - It is defined as the void volume to the solid volume existing in the soil. It is denoted by the term (e).

Void ratio in loosest state $=0.91$

Void ratio in dense state $=0.35$

$$
\text { Ratio }=\frac{0.91}{0.35} \Rightarrow 2.6
$$

54.As per IS 1172: 1993; the minimum domestic water consumption for bathing usage in $\ell / c a p i t a / d$ is:-
A. 40
B. 20
C. 55
D. 5

Answer ||| C

Solution |II

This code lays down a limit on domestic water consumption between 135 to 225 epcd.

The component of domestic water demand are (per capita per day)

| a) Drinking | 5 litre |
| :--- | :--- |
| b) Cooking | 5 litre |
| c) bathing | 55 litre |
| d) Cloth washing | 20 litre |
| e) utensils washing | 10 litre |
| f) house washing | 10 litre |
| g) flushing of water closet | 30 litre |
| Total | 135 litre/day/capita |

55.For irrigation, water having SAR 10 to 18 -
A. can be used for all soil and for all crops
B. suitable for coarse textured of organic soil with good permeability.
C. can be used for all soils of some precautions are taken
D. it not used for any irrigation.

Answer ||| B

Solution |||

Low sodium water $\left(\mathrm{S}_{1}\right)$ - SAR (0 to 10 )

Suitable fall all type of crops and all types of soils, except for those crops, which are highly sensitive to sodium.

Medium sodium water: - SAR: (10-18)

Suitable for course textured of organic soil with good permeability. Relatively unsuitable in fine textured soils.

High Sodium water $\left(S_{3}\right)$ :- SAR: 18 to 26

Harmful for almost all types of soils, require good drainages high leaching gypsum additions.

Very high sodium water $\left(\mathrm{S}_{\mathrm{q}}\right)$ :- SAR above 26

Unsuitable for irrigation
56. Permanent wilting point is
A. a characteristic of a plant
B. a soil characteristic
C. a soil characteristics modified by a plant
D. dependent on soil water plant fertilizer interaction

Answer ||| B

Solution |||

Permanent wilting point is a soil characteristic it is a conditions in which plant is no longer able to extract water from the soil for its growth.
57.Consider the following statements related to the advantages of concrete sleepers:

1. Concrete sleepers can generally be mass produced using local resources.
2. Concrete sleepers are not suitable for beater packing.
3. Concrete sleepers have a very long lifespan.
4. Concrete sleepers have no scrap value.

Which of the above statements is/are correct?
A. 1 only
B. 1 and 3 only
C. 2 only
D. 2 and 4 only

Answer ||| B

Solution |||

Advantages
(a)Concrete sleepers with elastic fastenings allow a track to maintain better gauge, cross-level, and alignment.
(b) Since they are bad conductors of electricity, concrete sleepers can be used in track-circuited areas.
(c)Concrete sleepers are neither inflammable nor subjected to damage by pests or corrosion under normal circumstances.
(d)Concrete sleepers have a very long lifespan, probably 40-50 years.
(e)Concrete sleepers can generally be mass-produced using local resources.
(f) Concrete sleepers are better for packing of ballast through machine due to its flat base

Disadvantages
(a)Handling and laying concrete sleepers is difficult due to their heavy weights.
(b)Concrete sleepers are heavily damaged at the time of the derailment.
(c)Concrete sleepers have no scrap value.
(d)Concrete sleepers are not suitable for beater packing.
58. What should be the ratio of maximum overtaking zone to minimum overtaking zone.
A. $\frac{3}{5}$
B. $\frac{5}{3}$
C. $\frac{5}{8}$
D. $\frac{8}{5}$

Answer ||| B

Solution |II

Minimum overtaking zone is $3 \times$ OSD. And maximum overtaking zone is $5 \times$ OSD. Where OSD means overtaking sight distance.
59. Which one of the following are provided to give access to properties along an important highway with controlled access to expressway or freeway?
A. Lay-bys
B. Frontage roads
C. Driveways
D. Cycle tracks

Answer ||| B

Solution |||

1. Lay-bys - A lay-by is a short strip of the road by the side of the main road, where cars can stop for a while.
2. Frontage road- A frontage road is a local road running parallel to a higher-speed, limited-access road. A frontage road is often used to provide access to private driveways, shops, houses, industries or farms.
3. Driveway - A private road for vehicles, often connecting a house or garage with a public road
4. Cycle track - Separate track on the side of the road for cycling.
60.Specific capacity of well
A. Decreases with the diameter
B. Increases with the discharge rate
C. Varies linearly with the draw clown
D. Decreases with time from the start of pumping

Answer ||| D

Solution |||

The specific capacity is $\mathrm{T}=\frac{\mathrm{Q}}{\mathrm{S}_{\mathrm{w}}}=\frac{\mathrm{Q}}{\mathrm{c}_{1} \mathrm{Q}+\mathrm{C}_{2} \mathrm{Q}^{2}}$
The specific capacity is
$\frac{Q}{S_{w}}=\frac{1}{\frac{1}{4 \pi} \ln \frac{2.25 T t}{r^{2}{ }_{1} S}+C_{2} Q}$

Where, $t=$ time after the start of pumping. The term $C_{2} Q$ is to account for well loss. It can be seen that the specific capacity depends $T, s, t, r_{w}$ and $Q$. further, for a given well it is not a constant, but decrease with increases in $Q \& t$.
61.A discharge of 10 cumec of water is applied to a field, with area of 30 ha for 5 hrs, with water application efficiency of $70 \%$. What is quantity of water stored in the root zone of the crop?
A. $25714 \mathrm{~m}^{3}$
B. $126000 \mathrm{~m}^{3}$
C. $180000 \mathrm{~m}^{3}$
D. $18000 \mathrm{~m}^{3}$

Answer ||| B
Solution |II
$\mathrm{Q}=10$ cumec

Irrigation duration $=5 \mathrm{hr}$
$\eta_{\mathrm{a}}=70 \%$

Water delivered of the field $\Rightarrow \mathrm{Q} \times 5 \mathrm{hr}$
$=10 \times 5 \times 60 \times 60$
$=180000 \mathrm{~m}^{3}$.
$\eta_{\mathrm{a}}=\frac{\text { water stored in root zone(ws) }}{\text { water delivered to field }}$
$0.7=\frac{W S}{180 ก ก \text { n }}$
$W s=126000 \mathrm{~m}^{3}$.
62.Consider the following Statements:-
1). Piezometer is used to measure small variation of Pressure above or below ambient pressure.
2). Thixotropic fluid exhibits decrease in viscosity with time

Which of the above statements is are correct?
A. Only 1
B. Only 2
C. both 1 and 2
D. Neither 1 and. 2

Answer ||| B

Solution |||

Piezometer is the simplest form of monometer for measuring gauge pressure. It measure only the gauge pressures.

It would not work for negative gauge pressures, because air would flow into the container through the tube.

The use of piezometer is also impractical for measuring large pressure, since for that vertical tube would need to be very long.
63. Which of the following is the approximate triaxial test to assess the immediate stability of an unloading problem, such as an excavation of a clay slope?
A. CU Test
B. CD Test
C. UU Test
D. None

## Answer ||| A

Solution |||

For loading condition

Immediate stability is attained by UU Test

Immediate settlement is attained by CU Test

For unloading condition

Immediate stability is attained by CU Test.

As in CU Test consolidation process takes time to complete. So while unloading if we perform the CU test, we can immediately perform the test for obtaining immediate settlement.
64.Calculate the total quantity (cubic meter) of the coarse aggregate required for an isolated rectangular footing of size $3 m \times 2 m$, if 1:2:4 cement concrete is used. The depth footing is 600 mm .
A. 2.05
B. 2.46
C. 3.17

## D. 3.82

## Answer ||| C

Solution |||

Volume of concrete required for footing $=3 \times 2 \times 0.6=3.6$ cum

Volume of dry concrete $=1.54 * 3.6=5.544$

Quantity of coarse aggregate $=4 / 7 \times 5.544=3.168$ cum
65.The unconfined compressive strength of a clay in un-disturbed and disturbed state was found to be $180 \mathrm{kN} / \mathrm{m}^{2}$ and $20 \mathrm{kN} / \mathrm{m}^{2}$ or respectively. Based on sensitivity the soil may be classified as
A. In-sensitivity
B. Sensitivity
C. extra sensitive
D. quick days

Answer ||| C

Solution |||

Sensitivity $=\frac{\text { qu (undistribulted) }}{\text { (qu)remoulded }}$
$=\frac{180}{20}=9$

| Sensitivity | Nature of soil |
| :--- | :--- |
| $<1$ | Insensitive |
| 1 to 2 | Little sensitive |
| $2-4$ | Low sensitive |
| $4-8$ | Moderate |
|  | Sensitive |
| $8-16$ | Extra sensitive |
| $>16$ | Quick days |

66.Municipal taxes are assessed on percentage of net income from property and it varies from
A. $2 \%$ to $5 \%$
B. $6 \%$ to $9 \%$
C. $10 \%$ to $12 \%$
D. $18 \%$ to $25 \%$

Answer ||| D

Solution |||

Municipal tax is levied at flat rates on taxable income determined for municipal taxation. The rate varies between $16.50 \%$ and $23.50 \%$, depending on the municipality.
67.In general, the height of capillary fringe varies from
A. $0-0.5 \mathrm{~m}$
B. $0.5-1 \mathrm{~m}$
C. 1 - 1.5 m
D. 2-2.5m

## Answer ||| C

Solution |||

The height to which the soil water rises above the water table by capillary action is known as capillary fringe. Generally, the height of capillary fringes varies from 1 m to 1.5 m . When the water table comes to 1.5 m below the surface of the soil, the land is said to be water logged.
68.If critical velocity ratio is 1.15 , which of the following will occur
A. sitting in canal
B. Scouring in canal
C. Both sitting in scouring
D. None of the above

Answer ||| B

Solution |||

As per kennedy's theory critical velocity in channel is given by-
$\mathrm{V}_{\mathrm{c}}=0.55 \mathrm{~m} \mathrm{y}^{0.64} \mathrm{~m}=$ critical velocity ratio $]$
$m=\frac{\operatorname{actualvelocity}\left(V_{a}\right)}{\operatorname{Criticalvelocity}\left(V_{c}\right)}$
$M>1$ i.e $V_{G}>V_{c} \rightarrow$ scouring in canal
$\mathrm{M}<1$ i.e $\mathrm{V}_{\mathrm{a}}>\mathrm{V}_{\mathrm{c}} \rightarrow$ sitting in canal
$M=1$ i.e $V_{a}>V_{c} \rightarrow$ There will be no sitting and scouring.
69.For an unconfined aquifer, the specific yield is $30 \%$ specific retention is $15 \%$ and permeability is $35 \mathrm{~m} /$ day the volume of water lost from storage per meter drop in the water table per $100 \mathrm{~km}^{2}$ area of aquifer is ?
A. $20 \mathrm{Mm}^{3}$
B. $15 \mathrm{Mm}^{3}$
C. $30 \mathrm{Mm}^{3}$
D. $35 \mathrm{Mm}^{3}$

## Answer ||| C

Solution |||

Given $\mathrm{S}_{\mathrm{y}}=30 \% \mathrm{~S}_{\mathrm{r}}=15 \% \mathrm{k}=35 \mathrm{~m} /$ day

Porosity $\eta=S y+S_{r}=15+30 \Rightarrow 45 \%$

Specific yield $=\frac{\text { volume of water lost }}{\text { volume of aquifer }}$

Volume of water lost $\Rightarrow S_{y} \times$ volume of aquifer
$\Rightarrow 0.3 \times 100 \times 10^{6} \times \mathrm{m}^{3}$
$\Rightarrow 0.3 \times 100 \times 10^{6} \times 1 \times \frac{1}{10^{6}} \mathrm{Mm}^{3}$
$\Rightarrow 30 \mathrm{Mm}^{3}$
70.The shear strain induces in a body of volume V , due to
A. Shape change occurs without a change in volume
B. Length change occurs without a change in volume
C. Area change occurs without a change in volume
D. Volume change occurs along with angle.

Answer ||| A
Solution |II

Shear strain:

If there is no change in volume or length either there is only a change in the shape of a body such in shape is known as shearing strain.

In other words, if the strain is caused because of tangential stress, and it is defined as the angle through which a plane perpendicular to the fixed surface of the cubical body et turned under effect of tangential force.
71.Maximum scour depth ( $\mathrm{d}_{\max }$ ) for condition of flow for upstream noses of guide banks.
A. 1.5 d
B. 2.75 d
C. 2 d
D. 1.75 d

Answer ||| B

Solution |II

Lacey's formula for normal scouring depth in alluvial streams
$\mathrm{d}_{\max }=\mathrm{k} . \mathrm{d}$
$\mathrm{d}=$ normal scouring depth
$\mathrm{K}=\mathrm{a}$ constant it varies according to the type of river flow.
$K=1.27$ for straight reach
$K=1.5$ for moderate bend.
$K=1.75$ for sharp/sewer bend
$K=2.0$ for $9^{\circ}$ bend and at the noise of packs
$K=2.75$ for upstream noses of guide bank.
72.In a brick sewer pipe the permissible velocity of water is
A. $3 \mathrm{~m} / \mathrm{sec}$
B. $0.6 \mathrm{~m} / \mathrm{sec}$
C. $1.75 \mathrm{~m} / \mathrm{sec}$
D. $4 \mathrm{~m} / \mathrm{sec}$

Answer ||| C

Solution |II
Type of channel Permissible velocity

Concreate line canal $1.8-2 \mathrm{~m} / \mathrm{sec}$

For earthen channel $0.6-1.2 \mathrm{~m} / \mathrm{sec}$

Cast iron sewer pipe $3.5-4.5 \mathrm{~m} / \mathrm{sec}$

Brick sewer pipe 1.5-2.5 m/sec
73. Which of the following in/are the assumption of burmister method: -

1) Elastic modulus of top layer is highest
2) The layers are in constant contact.
3) Materials in each layers are isotropic, homogenous and elastic.
A. 1, 2 only
B. 2, 3 only
C. 1, 3 only
D. All

Answer ||| D

Solution |||
74.Duration along the critical path defines which of the following?
A) Shortest duration needed
B) Shortest duration permissible
C) Longest duration needed
D) Longest duration permissible

Select the code for the correct answer from the options given below:
A. A and B only
B. A and D only
C. B and C only
D. C and D only

Answer ||| B

Solution |II

Critical path is shortest duration needed and longest duration permissible.
75.For nine number rain gauge stations with an error of $10 \%$ in the estimation of mean of the rainfall, the coefficient of variation of rainfall Cv obtained as:-
A. 10
B. 20
C. 30
D. 40

## Answer ||| C

Solution |||

$$
\begin{aligned}
& N=\left(\frac{C_{v}}{\varepsilon}\right)^{2} \\
& \Rightarrow 9=\left(\frac{C_{v}}{10}\right)^{2} \\
& \Rightarrow C_{\mathrm{v}}=3 \times 10=30 \%
\end{aligned}
$$

76.If total hardness of water is less than its total alkalinity the non-carbonate hardness will be equal to?
A. Total Alkalinity
B. Total Hardness
C. Zero
D. None of the above

Answer ||| C

Solution |||

Carbonate hardness $(\mathrm{CH})=$ Minimum of [T.H, Alkalinity]

If alkalinity > T.H then $[\mathrm{CH}=\mathrm{TH}]$
$\therefore$ Non carbonate hardness $(\mathrm{NCH})=\mathrm{TH}-\mathrm{CH}$
$\therefore \mathrm{NCH}=\mathrm{CH}-\mathrm{CH} \Rightarrow \mathrm{O}$
77. The particle size distribution curve with steep slope indicate that the type of soil is
A. Well graded soil
B. Gap graded soil
C. uniform soil
D. None of above

Answer ||| C
Solution |II

Particle size distribution curve with steep slope indicate uniform size soil.

This soil has coefficient of uniformity $(\mathrm{Cu})=1$ means nearly same size of particle is present.

An excess or a deficiency of certain particle means gap graded soil

If all the size of particle is present it is well graded soil.
78.A cantilever beam of length ' $L$ ' carries a point load ' $P$ ' at a distance ${ }^{\frac{}{}{ }^{\prime} L \text { ' }}$ from the fixed end, find the deflection at a free end of the cantilever beam. (EI = constant)
A. $\frac{\mathrm{PL}^{3}}{8 \mathrm{IEI}}$
B. $\frac{4 \mathrm{PL}^{3}}{8 \mathrm{IEI}}$
C. $\frac{2 \mathrm{PL}^{3}}{27 \mathrm{EI}}$
D. $\frac{3 \mathrm{PL}^{3}}{18 \mathrm{EI}}$

Answer ||| B

Solution |II


Slope at Point ${ }^{\prime} C^{\prime}=\frac{P(L / 3)^{2}}{2 E I}=\frac{P L^{2}}{18 E I}$
and deflection at point ${ }^{\prime} \mathrm{C}^{\prime}=\frac{\mathrm{P}(\mathrm{L} / 3)^{3}}{3 \mathrm{EI}}=\frac{\mathrm{PL}^{3}}{81 \mathrm{EI}}$
$\therefore$ Deflection at free end $B .=\Delta c+\theta c \times 2 \frac{L}{3}$
$=\frac{\mathrm{PL}^{3}}{81 E \mathrm{I}}+\frac{\mathrm{PL}^{2}}{18 \mathrm{EI}} \times 2 \frac{\mathrm{~L}}{3}$

$$
=\frac{\mathrm{PL}^{3}}{81 \mathrm{EI}}+\frac{\mathrm{PL}^{3}}{27 \mathrm{EI}}
$$

$\Delta_{B}=\frac{4 \mathrm{PL}^{3}}{81 \mathrm{EI}}$
79.As per Indian standard recommendation, for hill area cone age of area of one rain gauge station.
A. $520 \mathrm{~km}^{2}$
B. $260 \mathrm{~km}^{2}$
C. $390 \mathrm{~km}^{2}$
D. $130 \mathrm{~km}^{2}$

Answer ||| D

Solution |||

As per IS recommendation: -

| Region | Area per rain gauge $\left(\mathrm{km}^{2}\right)$ |
| :--- | :--- |
| For plain region | $520 \mathrm{~km}^{2} /$ rain gauge |
| For 1000-meter elevation | $260-390 \mathrm{~km}^{2} /$ rain gauge |
| For hill area | $130 \mathrm{~km}^{2} /$ rain gauge |

80.Two sample of water $A$ and $B$ have $p H$ vale of 5.5 and 8.5 respectively. How many times more acidic sample $A$ is than sample $B$.
A. 3
B. 100
C. 1000
D. 300

Answer ||| C

Solution |||

For sample $A \rightarrow p H=-\log \left[\mathrm{H}^{+}\right]$
$\Rightarrow \mathrm{H}^{+} \Rightarrow 10^{-5.5}$

For sample $B \rightarrow \mathrm{pH}=-\log \left[\mathrm{H}^{+}\right]$
$\mathrm{H}^{+} \Rightarrow 10^{-8.5}$

Sample $A$ is $\frac{\left[\mathrm{H}^{+}\right] A}{\left[\mathrm{H}^{+}\right] B}$ times more acidic than $B$
$\mathrm{N}=\frac{10^{-5.5}}{10^{-8.5}} \Rightarrow 10-5.5+8.5$
$\Rightarrow 10^{3}$ times
81. In composition of good bricks, the total content of silt and clay, by weight, should not be less than:
A. $50 \%$
B. $60 \%$
C. $85 \%$
D. $90 \%$

Answer ||| C

Solution |||

In composition of good bricks earth the total content of silica and clay ( $50+30$ ) \% is approx $85 \%$.
82.A liquid jet of $30 \mathrm{~m} / \mathrm{s}$ velocity is striking a single symmetrical moving efficiently, the velocity of the vane should be
A. $15 \mathrm{~m} / \mathrm{s}$
B. $30 \mathrm{~m} / \mathrm{s}$
C. $10 \mathrm{~m} / \mathrm{s}$
D. $5 \mathrm{~m} / \mathrm{s}$

## Answer ||| C

Solution |II

In case of single symmetrical moving curved vane, for maximum efficiency
$\therefore$ jet velocity $(\mathrm{v})=30 \mathrm{~m} / \mathrm{s}$

$$
u=\frac{v}{3} \Rightarrow \frac{30}{3} \Rightarrow 10 \mathrm{~m} / \mathrm{s}
$$

$\rightarrow$ For series of symmetrical moving plate or curved plate in case of maximum efficiency

$$
\mathrm{u}=\frac{\mathrm{v}}{2}
$$

83. Minimum size of weld for 9.5 mm thick plate will be.
A. 3.0 mm
B. 5.0 mm
C. 6.0 mm
D. 8.0 mm

## Solution |||

According to IS 800-2007, the minimum size of weld is given below:

| The thickness of <br> thicker member (mm) | Minimum <br> size (mm) |
| :--- | :---: |
| $\mathbf{t} \leq \mathbf{1 0}$ | 3 |
| $10<t \leq 20$ | 5 |
| $20<t \leq 32$ | 6 |
| $32<t \leq 50$ | 8 |

So, minimum size of weld if the plate thickness $<10 \mathrm{~mm}=3 \mathrm{~mm}$
84.What should be the psychological widening for design speed of $80 \mathrm{~km} / \mathrm{hr}$. and radius of horizontal curve is 270 meters.
A. 0.1 meter
B. 0.27 meter
C. 0.51 meter
D. 0.43 meter

Answer ||| C

Solution |||

Psychological widening $=\frac{\mathrm{V}}{2.64 \sqrt{\mathrm{R}}}$
$\mathrm{V} \rightarrow$ design speed in meter/sec
$R$, radius of horizontal curve in $m$.

So, Psychological widening $=\frac{80 \times \frac{5}{18}}{2.64 \sqrt{270}}$
$=0.512$ meter
85. In a Mohr circle the shear stress $\mathrm{T}_{1}$ on the plane of maximum obliquity is-
A. Less the maximum shear stress $T_{\text {max }}$
B. More the maximum shear stress $T_{\text {max }}$
C. Equal to the maximum shear stress $T_{\text {max }}$
D. Numerically equal to $\left(\sigma_{1}-\sigma_{3}\right)$

## Answer ||| A

Solution |||


The plane of maximum obliquity is most liable to failure and not the plane of maximum shear stress on the plane of maximum obliquity is less than the maximum shear stress.
86.If a plane truss satisfies the condition $m=2 \mathrm{~J}-3$ where m is members, J is no of joint then it is
A. Determinate internally
B. Determinate externally
C. Indeterminate internally
D. Indeterminate externally

Answer ||| A

Solution |II

Internal degree of indeterminacy
$D_{s i}=m-(2 J-3)$

So, internally determinate's structure.
87. The soil which can store water and allow a small quantity to flow through it over a long period is called?
A. Aquifer
B. Aquitard
C. Aquifuge
D. Aquiclude

Answer ||| B

Solution |||

Aquifer: - These are permeable formations having structures which permit appreciable quantity of water to move through then under ordinary flow conditions.

Aquiclude: - Aquiclude are impermeable formations which contain water but are not capable of transmitting and supplying.

Aquitard: - The soil which store water and only seepage is possible is known as aquitard.

Aquifuge:- Neither porous nor permeable.
88.The speed and delay studies on a defined section of highway are conducted by
A. Radar gun
B. Traffic Countess
C. Moving car method
D. Enoscope

## Answer ||| C

Solution |||

Moving car method/Float are method is a for speed and delay studies on a defined section or highway.

Radar gun method and enoscope is used for spot speed study. Traffic counters are used for traffic volume study.
89.If peak hourly volume of particular lane is 1500 veh. /hr., ad maximum 15 min. volume in peak hour is 2500 veh. /hr. So, what should be the peak hourly factor.
A. 0.6
B. 0.3
C. 0.15
D. 0.075

Answer ||| C

Solution |||

Peak hourly factor $=\frac{\mathrm{v} / 4}{\mathrm{v}_{15}}$

Where, $v \rightarrow$ peak hourly volume
$\mathrm{V}_{15} \rightarrow$ maximum 15-minute volume in peak hour.
So, PHF $=\frac{\frac{1500}{4}}{2500}=0.15$
90. The Mach number, $M$ of a compressible fluid flow is $0.3<M<1$. The fluid flow is usually classified as.
A. Incompressible
B. subsonic
C. super sonic
D. Hypersonic

Answer ||| B

Solution |||

Mach No. $=\sqrt{\text { Interia force }}$
$M<1=$ subsonic $M<0.3$ incompressible flow is considered.
M $>1$ (supersonic
$M=1$ sonic

M > 6 Hypersonic
91.The efficiency of a pumping set is generally assumed to be
A. $55 \%$ to $60 \%$
B. $65 \%$ to $70 \%$
C. $75 \%$ to $80 \%$
D. $85 \%$ to $90 \%$

Answer ||| B
Solution |||

The efficiency of a pumping set is generally assumed to be $65 \%$ to $70 \%$
$\rightarrow$ before selecting an irrigation pumping set, following condition must include.
i) Source of water (well, river, pond, etc)
ii) Required pumping flow rate
iii) Total suction head
iv) Total dynamic head
92.The liquid limit and plastic limit of a sample are $64 \%$ and $28 \%$ respectively. The \% of the soil fraction with grain size finer than 0.002 mm is 24 . The activity of the soil sample is
A. in active
B. normal active
C. active
D. none

Answer ||| C

Solution |||

Activity $=\frac{\operatorname{Ip}\left(W_{L}-W_{p}\right)}{\text { \%by weight of clay fraction }}$
$=\frac{64-28}{24}=\frac{36}{24}=\frac{3}{2}=1.5$

| Activity | State |
| :--- | :--- |
| $<0.75$ | In active |
| $0.75-1.25$ | Normal |
| $>1.25$ | Active |

93.The peak factor for estimating maximum hourly demand relative to average hourly demand is
A. 1.8
B. 1.5
C. 2.7
D. 2.0

## Answer ||| C

Solution |||

Peak factor for various situation: -
i) Maximum daily demand $=1.8 \times$ Average daily demand
ii) Maximum hourly demand $=1.5 x$ Average hourly demand of maximum day
iii) Maximum hourly or peak demand $=2.7 \times$ Average hourly demand.
94.Specific surface of a soil particle having particle size $D$ is given by
A. $\frac{D}{2}$
B. $\frac{2}{D}$
C. $\frac{6}{D}$
D. $\frac{D}{6}$

## Answer ||| C

Solution III

Specific surface is defined as ratio of surface area and volume hence,
$=\frac{4 \pi\left(\frac{D}{2}\right)^{2}}{\frac{4}{3} \pi\left(\frac{D}{2}\right)^{3}} \Rightarrow \frac{6}{D}$

If particle is not spherical and it is passing through sieve size a and retained on sieve size b then specific surface is $=\frac{6}{\sqrt{a b}}$
95.As per IS 10500: 2012 the acceptable limit of arsenic is?
A. $0.01 \mathrm{mg} / \mathrm{l}$
B. $0.05 \mathrm{mg} / \mathrm{l}$
C. $0.001 \mathrm{mg} / \mathrm{l}$
D. $0.005 \mathrm{mg} / \mathrm{l}$

Answer ||| A

Solution |||
$\rightarrow$ Arsenic is toxic metal
$\rightarrow$ It effect the lungs of body
$\rightarrow$ Permissible limit $\ngtr 0.01 \mathrm{mg} / \mathrm{l}$
96. Moist soil has a degree of saturation between.
A. 0 to 0.25
B. $0.25-0.5$
C. $0.5-0.75$
D. $>0.75$

## Answer ||| C

Solution |||

Degree of saturation $=\frac{V w}{V v}=\frac{\text { Volume of water in the soil }}{\text { Volume of voids of the given soil }}$

| Degree of <br> Saturation | Soil <br> Type |
| :--- | :--- |
| $0-0.25$ | Humid |
| $0.25-0.5$ | Damp |
| $0.5-0.75$ | Moist |
| $0.75-1.0$ | Wet |

97.Relative density of a compacted sand is 0.7 or $70 \%$ which state is in the sand soil?
A. Loose soil
B. medium dense
C. dense soil
D. very dense soil

Answer ||| C
Solution III

Relative density based classification of granular soil.

| $\mathrm{I}_{\mathrm{D}} \%$ | Type of soil |
| :--- | :--- |
| $0-15$ | Very loose soil |
| $15-35$ | Loose soil |
| $35-65$ | Medium soil |
| $65-85$ | Dense soil |
| $>85$ | Very dense |
|  | soil |

98. Consider the following statements related to the advantages of uniformity of rail gauges :
99. As transshipping is not required, there is no breakage of goods.
100. Large sheds to store goods are not required.
101. Labour strikes, etc. do not affect the service and operation of trains.

Which of the above statements are correct?
A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1,2 and 3

Answer ||| D
Solution III

Uniformity of Gauges

Gauge to be used in a particular country should be uniform throughout as far as possible, because it will avoid many difficulties experienced in a non-uniform system. The uniformity of gauges results in the following advantages:
(1) The delay, cost and hardship in transshipping passengers and goods from the vehicles of one gauge to another is avoided.
(2) As the transshipping is not required, there is no breakage of goods.
(3) Difficulties in loading and unloading are avoided and labour expenses are saved.
(4) Possibility of thefts and misplacement, while changing from one vehicle to another, is eliminated.
(5) Large sheds to store goods are not required.
(6) Labour strikes, etc. do not affect the service and operation of trains.
(7) Surplus wagons of one gauge cannot be used on another gauge. This problem will not arise if gauge is uniform.
(8) Locomotives can be effectively used on all the tracks if a uniform type of gauge is adopted.
(9) Duplication of equipment such as platforms, sanitary arrangements, clocks, etc. is avoided. This saves a lot of extra expenditure.
(10) During military movement, no time is wasted in changing personnel and equipment from one vehicle to another if gauge is uniform.
99.The thickness requirement for a pavement material of C-value 25 is 20 cm . What will be the thickness of pavement for material of c-value 40 as per California resistance value method?
A. 12.5 cm
B. 16.6 cm
C. 18.2 cm
D. 19.8 cm

## Answer ||| C

Solution |II
As per California resistance value method:-
$T_{(c m)} \propto \frac{1}{c^{1 / 5}}$
$\Rightarrow \frac{T_{1}}{T_{2}}=\left(\frac{C_{2}}{C_{1}}\right)^{1 / 5}$
$=\frac{20}{T_{2}}=\left(\frac{25}{40}\right)^{1 / 5}$
$\Rightarrow T_{2}=18.2 \mathrm{~cm}$
100.If a thin plate is held parallel to fluid stream the pressure drag on it is -
A. Maximum
B. minimum
C. zero
D. None of these.

Answer ||| C

Solution |||
viscous forces and pressure forces are responsible for drag forces.
$\rightarrow$ In Case of flow over a thin plate Placed Parallel to a stream of flowing fluid, the flow separation (if occurs), would occur only towards the rear end and the wake is negligibly small. The resulting Pressure drag will also be very small and approximate to zero.
$\rightarrow$ On the other hand, Pressure drag will be large when the thin plate is held Perpendicular to the flow.
101.In traffic engineering design speed is considered as
A. 15 percentile speed
B. 50 percentile speed
C. 85 percentile speed
D. 98 percentile speed

Answer ||| D

Solution |||
$\rightarrow 98$ percentile speed is called as design speed.
$\rightarrow 85$ percentile speed is called as safe speed.
$\rightarrow 15$ percentile speed is taken as law limit 10 f speed.
102.For geometric design of highway, the code is followed.
A. IRC: 55
B. IS: 875
C. IRC: 88
D. IRC: 73

## Solution |||

For geometric design of rural highway, we follow IRC 73.
103.Coning of wheels is provided
A. To check lateral movement of wheels
B. To avoid damage to inner faces of rails
C. To avoid discomfort to passengers
D. All of the above

Answer ||| D

Solution |||

Coning of wheels: The rim or flanges of the wheels are never made flat but they are in the shape of a cone with a scope of about 1 to 20 . This is known as coning of wheels
$\Rightarrow$ Purpose of coning of wheel:

1. To check lateral movement of wheels and keep it in central position.
2. To avoid damage to inner faces of rails.
3. To avoid discomfort to passengers.

Hence all given options are current.
104.Under the same conditions, which one of the following is most suitable for using the Isohyetal method to evaluate the mean aerial depth of rainfall?
A. Plain country
B. Gently sloping basin
C. Undulation country
D. A place where the precipitation includes snow melt.

Answer ||| B

Solution |||

Isohyetal method

* Isohyets are contours of equal precipitation analogous to contour lines on a topographical map.
* In the Isohyetal method, precipitation values are plotted at their respective station on a suitable base map, and isohyets are drawn to create an isohyetal map.
* Isohyetal lines are based on interpolation between rain gauge stations. Which contracting isohyets, it is assumed that rainfall between two stations varies linearly, unless abrupt charges in topography indicate otherwise
* So, a gently sloped basin is most suitable for linearly changing rainfall and hence for the isohyetal method.
105.The viscosity of liquids decrease with increase in temperature due to: -
A. Decreased cohesive forces
B. Increased cohesive forces
C. Decreased molecular momentum transfer
D. Increased molecular momentum transfer

Answer ||| A

Solution |||

Viscosity relation with temperature: -

Liquid: - In liquids, the main cause of viscosity is cohesion between the molecules.

With the increase in temperature, the cohesive force decreased and the distance between the molecules become more due to increase in energy of particles hence the movement of particle become easy.

Hence, viscosity of liquid decreases with an increase in temperature.
106. Calculate an approximate estimate (Rs.) of the building with total plinth area of the building is 500 square meters. The rate of the plinth area is Rs. 3,000 per square meters. The costs of the water supply and contingencies are $7 \%$ and $5 \%$ of cost of construction respectively.
A. 1500000
B. 1650000
C. 1680000
D. 1870000

Answer ||| C

Solution |II

Estimated cost of construction $=$ Rate $\times$ Area
$=3000 \times 500$
$=R s .1500000$

Total estimated cost of building

$$
=1500000+.07 \times 1500000+.05 \times 1500000
$$

$=R s .1680000$
107.Arrange the following building materials in the increasing order of density of materials.

Granite, Steel, River sand, Water
A. Water, River sand, Granite, Steel
B. River sand, Granite, Water, Steel
C. Water, River sand, Steel, Granite
D. River sand, Water, Granite, Steel

Answer ||| A

Solution |||

Density of water $=9.81 \mathrm{kN} / \mathrm{m} 3$ or $1000 \mathrm{~kg} / \mathrm{m} 3(\mathrm{SG}=1)$

Density of steel $=7850 \mathrm{~kg} / \mathrm{m} 3(\mathrm{SG}=7.85)$

Density of sand = Approx. 18 kN/m3 (SG = 1.84)

Density of granite, SG = 2.7
108. Tensile stress $\sigma_{x}$ and $\sigma_{y}$ act right angle to each other on the element, if the strain in the direction of $\sigma_{x}$ is thrice the strain in the direction of $\sigma_{y}$, Then the ratio of $\frac{\sigma_{y}}{\sigma_{x}}$ is
A. $\frac{3+\mu}{1-3 \mu}$
B. $\frac{1+3 \mu}{3+\mu}$
C. $\frac{3-\mu}{1+3 \mu}$
D. $\frac{1-3 \mu}{3-\mu}$

Answer ||| B

Solution |||
Given $E_{X}=3 E_{Y}$
$\because E_{x}=\frac{\sigma_{X}}{E}-\frac{\mu \sigma_{y}}{E}$ and $E_{Y}=\frac{\sigma_{Y}}{E}-\frac{\mu \sigma_{X}}{E}$
$\therefore \frac{\sigma_{x}}{E}-\frac{\mu \sigma_{y}}{E}=$
$\Rightarrow \frac{\sigma_{X}}{E}(1+3 \mu)=\frac{\sigma_{y}}{E}(3+\mu)$
$\Rightarrow \frac{\sigma_{y}}{\sigma_{x}}=\frac{1+3 \mu}{3+\mu}$
109.The depth of corn root zone is
A. 25 cm
B. 80 cm
C. 70 cm
D. 60 cm

Answer ||| A

Solution |II

| Crop | Depth of water and <br> number of waterings |
| :--- | :--- |
| Corn | $25 \mathrm{~cm}(5-6$ times $)$ |
| wheat | $30-40 \mathrm{~cm}(5-6$ times $)$ |
| Rice | $90-150 \mathrm{~cm}(5-6$ times $)$ |
| Potato | $60-90 \mathrm{~cm}(10$ times $)$ |
| Mustard | $45 \mathrm{~cm}(3-4$ times $)$ |

110.W-index will be always
A. Equal to $\phi$-index
B. More than $\phi$-index
C. Less than $\phi$-index
D. A constant fraction of $\phi$-index

## Answer ||| C

Solution |||

W index also considers the losses, which are not included in the $\phi$-index calculation.
$\phi$ index $=\frac{P-R}{t}$

W index $=\frac{P-R-\text { losses }}{t}$

Hence W index is always less than $\phi$ index.
111.A short column of the symmetric cross-section is subjected on eccentric vertical compressive load $P$ at eccentricity 'e'


To avoid tensile stress in the short column, the eccentricity ' $e$ ' should be-
A. $\mathrm{e} \leq \frac{\mathrm{h}}{6}$
B. $\mathrm{e} \geq \frac{\mathrm{h}}{6}$
C. $\mathrm{e} \leq \frac{\mathrm{h}}{3}$
D. $e \geq \frac{h}{3}$

Answer ||| A

Solution |||

Direct stress
$\sigma_{a}=\frac{M}{I} \times y=\frac{\mathrm{P} \times \mathrm{e}}{\frac{\mathrm{bh}^{3}}{12}} \times \frac{\mathrm{h}}{2}=\frac{6 \mathrm{Pe}}{\mathrm{bh}^{2}}$
$\sigma_{\text {max }}=$ Maximum stress (along CD) $=\sigma_{\mathrm{a}}+\sigma_{\mathrm{b}}$
$\sigma_{\text {min }}=$ Minimum stress (along $A B$ ) $=\sigma_{a}-\sigma_{b}$
$\Rightarrow \sigma_{\text {min }}<0 \rightarrow$ Tensile stress along $A B$
$\sigma_{\text {min }}>0 \rightarrow$ Compressive stress Along AB.
$\sigma_{\text {min }}=0 \rightarrow$ No tensile stress
$\Rightarrow \sigma_{a}-\sigma_{b} \geq 0$
$\Rightarrow \sigma_{\mathrm{a}} \geq \sigma_{\mathrm{b}}$
$\Rightarrow \frac{6 \mathrm{P}}{\mathrm{bh}} \geq \frac{6 \mathrm{Pe}}{\mathrm{bh}^{2}}$
$\Rightarrow \mathrm{e} \leq \frac{\mathrm{h}}{6}$
112. Which one of the following is not a cause of water logging?
A. Excess tapping of the ground
B. frequent irrigation
C. High water table
D. Seepage from unlined canals

Answer ||| A

Solution III

Causes of water logging are:-
i. Adverse topography and unfavourable sub soil geology
ii. Lack of catchment area production
iii. Rainfall characteristics
iv. Seepage from unlined canals
v. Higher water table
vi. Frequent irrigation
vii. Lack of peoples participation.
113.A soil subgrade has following data:

Soil passing $75 \mu$ sieve is $=65 \%$

Liquid limit $=40 \%$

Plastic limit $=25 \%$

Determine the value of G.I. (group index)?
A. 7.25
B. 11.25
C. 10.25
D. 8.0

Answer ||| D

Solution |||
$\mathrm{G}_{1}=0.2 \mathrm{a}+0.01 \mathrm{bd}+0.005 \mathrm{ac}$
$a=(\%$ finer passing $75 \mu$ sieve -35$)=p-35 \ngtr 40$
$\mathrm{b}=p-15>40$
$\mathrm{c}=W_{L}-40>20$
$d=I_{p}-10>_{20}$
$\mathrm{W}_{\mathrm{L}}=$ liquid limit
$\mathrm{I}_{\mathrm{P}}=$ plasticity index

Hence
$\mathrm{GI}=0.2 \times 30+0.01 \times 40 \times 5+0.005 \times 30 \times 0$

$$
\mathrm{GI}=8.0
$$

114.The speed ratio for Pelton wheel varies form
A. 0.45 to 0.50
B. 0.6 to 0.7
C. 0.3 to 0.4
D. 0.8 to 0.9

Answer ||| A

Solution |||

Speed ratio ( $\mathrm{k}_{\mathrm{u}}$ ) of a Pelton turbine is defined as the ratio of the tangential velocity of wheel $u$ to the theoretical velocity of the jet.
115.For a single point load w moving on symmetrical 3-hinged parabolic arch of span $L$, the maximum hogging moment occurs at a distance $x$ from ends. The value of $x$ is
A. 0.211 L
B. 0.25 L
C. 0.34 L
D. 0.5 L

Answer ||| B

Solution |||

Considering a three hinged parabolic arch of span and subjected to a moving load W, the position of the point load for

Maximum negative B.M is 0.25 L from end supports.

Maximum positive B.M is 0.211 L from end supports.
116. "Composite Sleeper Index" is employed to determine
A. Sleeper density requirement
B. Number of fixtures requirement for a particular type of sleeper
C. Durability of sleeper
D. Mechanical strength of wooden sleepers, and thereby, gives its suitability to be used as sleepers

Answer ||| D

Solution |||

Composite sleeper index (CSI): It is evolved from a combination of the properties of strength and hardness. It is an index used to determine the suitability of a particular timber for use as a sleeper from the point of view of mechanical strength.

CSI $=(S+10 H) / 20$
$S=$ Strength index

H = Hardness index
117.The average normal flow of traffic on cross-roads $A$ and $B$ during design period is 300 and 500 . Saturation flow is 600 and 1500 for $A$ and $B$ respectively. If all red time is 14 sec . Find optimum cycle length by webster method?
A. 1.6 min
B. 1.1 min
C. 3.1 min
D. 2.6 min

Answer ||| C

Solution III

Optimum cycle length, $C_{0}=\frac{1.5 L+5}{1-Y}$
$\mathrm{L}=$ total time lost in a cycle length $=\mathrm{n} . \mathrm{t}_{\mathrm{SL}}+$ All red time
$\mathrm{n}=$ number of phases $=2$

Assume $\mathrm{t}_{\mathrm{sL}}=2 \mathrm{sec}$, if not provided.
$\mathrm{L}=2 \mathrm{n}+$ All red time.
$\mathrm{L}=4+14=18 \mathrm{sec}$
and, $y=y_{1}+y_{2}$
$y_{1}=\frac{q_{1}}{S_{1}}=\frac{300}{600}=0.5$
$y_{2}=\frac{q_{2}}{S_{2}}=\frac{500}{1500}=0.33$
$y=0.5+0.33=0.83$
$C_{0}=\frac{1.5 L+5}{1-Y}=\frac{1.5 \times 18+5}{1-0.83}=\frac{32}{0.17}=188.23 \mathrm{sec}=3.14 \mathrm{~min}$
118.A steel bar is sandwiched between two copper bars and both ends are fixed for temperature rise. How much tension or compression stress on the steel bar will be found-
A. Compressive stress twice of copper bar
B. Tensile stress twice of copper bar
C. Tensile stress half of copper bar
D. Compressive stress half of copper bar

Answer ||| B
Solution |||
$\because$ Coefficient of temperature $\alpha_{c u}>\alpha_{\text {st }}$
$\therefore$ Stress in copper will be compressive while stressing in steel tensile. Now, for temperature rise the following two conditions must be satisfied

1. Elongation of copper = Elongation of steel
$\Rightarrow L \alpha_{\mathrm{cu}} \Delta \mathrm{T}-\frac{\sigma_{\mathrm{c}}}{\mathrm{E}} \mathrm{L}=\frac{\sigma_{\mathrm{T}}}{\mathrm{E}} \mathrm{L}+\mathrm{L} \alpha_{\mathrm{st}} \Delta \mathrm{T}$

And
2. Compressive force in copper bar = Tensile force in steel bar
$\Rightarrow$ Assum Area of each bar A
$\therefore \sigma_{c} A+\sigma_{c} A=\sigma_{T} A$
$\Rightarrow 2 \sigma_{c} A=\sigma_{T} A$
$\Rightarrow 2 \sigma_{\mathrm{c}}=\sigma_{\mathrm{T}}$
$\therefore$ Total tensile force in steel $=2 \times$ (Compressive force in copper)
119. Which one of the following is not the method of tunneling in hard rock?
A. Full-face heading method
B. Heading and bench method
C. Drift method
D. Shaft method

Answer ||| D
Solution |II

## Major Method of Tunneling in Hard Rock

1. Full Face method
2. Heading and bench method
3. Drift method

* Central Drift Method
* Side drift method
120.RC $-2, \mathrm{MC}-2$ and SC -2 correspond to
A. Same viscosity
B. Viscosity in increasing order form RC -2 to SC -2
C. Viscosity in decreasing order from RC- 2 to SC -2
D. None


## Answer ||| A

Solution |II

Note: - cutback bitumen is obtained by mixing bitumen with volatile diluents to reduce its viscosity.

| Grade | Volatile diluent |
| :--- | :--- |
| RC (Rapid curing) | Naphtha, Gasoline, petrol |
| MC (Medium curing) | Kerosene, diesel |
| SC(Slow curing) | High boiling points diluent |

RC - 2, MC - 2 and SC - 2 have same viscosity as their grade is same but different solvent is added to reduce viscosity.
121. Which of these is a stiff, marine calcareous clay of greenish color?
A. Marl
B. Peat
C. Muck
D. Till

## Answer ||| A

## Solution |||

Marl soil: - These are fine grained calcium carbonated soil of marine origin. These are formed due to decomposition of cell mass and bones of aquatic life. Marl is a stiff, marine calcareous clay of greenish colour.
122.For an irrigated field having.

Field capacity $=40 \%$ Permanent wilting point $=20 \%$

Permissible depletion of available moisture $\Rightarrow 40 \%$

Dry weight of soil $\Rightarrow 15 \mathrm{kNm}^{3}$ unit weight of water $=10 \mathrm{kNm}^{3}$ and effective rainfall $=30 \mathrm{~mm}$, what is the net irrigation requirement per meter depth of soil?
A. 300 mm
B. 150 mm
C. 120 mm
D. 90 mm

Answer ||| D

Solution |||

Given: $-F_{C}=40 \% P W P=20 \% A M=40 \%$

Total irrigation water requirement

$$
\begin{aligned}
& \mathrm{d}^{\prime} \Rightarrow \frac{\gamma \mathrm{d}}{\gamma \mathrm{w}} \times \mathrm{A} . \mathrm{M}(\mathrm{Fc}-\phi) \times 1000 \\
& \Rightarrow \frac{15}{10} \times 0.4(0.4-0.2) \times 1000
\end{aligned}
$$

$\mathrm{d}^{\prime} \Rightarrow 120 \mathrm{~mm}$

Net irrigation requirement $\Rightarrow$ total irrigating required - effective rainfall
$\Rightarrow 120-30$
$\Rightarrow 90 \mathrm{~mm}$
123.The canal has to irrigate 15000 hectares of rice with a duty of 1000 ha/cumec. For what discharge should the canal be designed, If the capacity factor is 0.8 and the time factor is 0.75 .
A. $16 \mathrm{~m}^{3} / \mathrm{s}$
B. $20 \mathrm{~m}^{3} / \mathrm{s}$
C. $25 \mathrm{~m}^{3} / \mathrm{s}$
D. $14 \mathrm{~m}^{3} / \mathrm{s}$

## Answer ||| C

Solution |||

Area $=15000$ ha Duty $=1000$ ha/cumec

Discharge for rice $=\frac{15000}{1000}=15 \mathrm{cumec}$
Supply at the head of the canal will be $\Rightarrow \frac{15}{0.75} \Rightarrow 20 \mathrm{~m}^{3} / \mathrm{s}$
Design discharge $=\frac{\text { full supply discharge }}{\text { Capacity factor }}=\frac{20}{0.8} \Rightarrow 25 \mathrm{~m}^{3} / \mathrm{s}$
124.The reaction locus for a two hinged semi-circular arch is
A. a horizontal line parallel to the span
B. a parabolic curve
C. a cycloid
D. a elliptical curve

Answer ||| A

Solution |||

Reaction locus is straight line parallel to the line joining abutments and height at пR/2.

$\Sigma M B=0$
$\mathrm{V}_{\mathrm{A}} \times 2 \mathrm{R}=\mathrm{wR}(1+\cos \theta)$
$\mathrm{V}_{\mathrm{A}}=\mathrm{W} / 2(1+\cos \theta)$
$H=W / n \sin ^{2} \theta$

Reaction locus of two hinged parabolic arch is parabolic curve.
125.The elevation of water table in a confined aquifer at two locations separated by a distance of 100 m is 1032 and 1028 m respectively. The permeability of aquifer is $12 \mathrm{~m} /$ day and porosity is $30 \%$. What is actual velocity of flow in the aquifer ?
A. $0.48 \mathrm{~m} /$ day
B. $1.6 \mathrm{~m} /$ day
C. $1 \mathrm{~m} /$ day
D. $1.2 \mathrm{~m} /$ day

Answer ||| B

Solution |||

According to Darcy's law

Discharge velocity $\mathrm{V}=\mathrm{Ki}$

Here, $i=\frac{h_{L}}{L}$ and $h_{L}=(1032-1028) m$
So, $V=12 \times \frac{(1032-1028)}{100} \mathrm{~m} /$ day
$\Rightarrow 12 \times \frac{4}{100} \frac{\mathrm{~m}}{\text { day }}$
$V_{\text {actual }}=\frac{\text { discharge velocity }}{\text { Porosity }} \eta=30 \%$
$\Rightarrow \frac{12 \times 4}{100 \times 30} \times 100 \Rightarrow 1.6 \mathrm{~m} /$ day
126. In an inward flow reaction turbine velocity of flow at the inlet is $4 \mathrm{~m} / \mathrm{s}$. It is guide vane makes an angle of $30^{\circ}$ to the tangential velocity direction of the runner, the absolute velocity of the water leaving the guide vanes is
A. $4 \mathrm{~m} / \mathrm{s}$
B. $8 \mathrm{~m} / \mathrm{s}$
C. $4.6 \mathrm{~m} / \mathrm{s}$
D. $2 \mathrm{~m} / \mathrm{s}$

## Answer ||| B

Solution |||

$$
\begin{aligned}
& V_{r 1}=4 \mathrm{~m} / \mathrm{s} \text { at the inlet } \\
& \varphi=60^{\circ} \\
& V_{r 1}=V_{r 2} \cos \varphi \\
& V_{r_{2}}=\frac{V_{r 1}}{\cos \phi}=\frac{4}{\cos 60^{\circ}}=8 \mathrm{~m} / \mathrm{s}
\end{aligned}
$$


127. Which of the following method is generally used for determination of in-situ mass density of soil?
A. water displacement method
B. shrinkage limit-method
C. Pycnometer method
D. Gas jar method

Answer ||| A
Solution |||

Methods for determining of in-situ mass density

Care cutter method

Sand replacement method

Water displacement method

Water balloon method

Radiation method

Nuclear density gauge

Electrical density gauges
128.The shape of recession limb of a hydrograph depends upon
A. Basin characteristics only
B. Storm characteristics only
C. Both basin characteristics and storm characteristics
D. None of these

Answer ||| A

Solution |II


Rising limb shape depends on storm and basin characteristics both but the recession limb starts after the storm has ended and hence it depends on basin characteristics only.
129.A soil having water content $20 \%$ specific gravity 2.5 and void ratio 0.7 . Calculate the degree of saturation.
A. $52.4 \%$
B. $71.4 \%$
C. $55 \%$
D. $60 \%$

Answer ||| B

Solution |||
$\mathrm{w}=20 \%=0.2 \mathrm{Gs}=2.5 \mathrm{e}=0.7$

We know that
$\mathrm{es}=\mathrm{Gw}$
$S=\frac{G W}{e} \Rightarrow \frac{2.5 \times 0.2}{0.7}=71.4 \%$
130.Sensitivity analysis is a study of
A. Comparison of profit and loss
B. Comparison of assets and liabilities
C. Change in output due to change in input
D. Economics of cost and benefits of the project

Answer ||| C

Solution |II

Sensitivity analysis is the study of how the uncertainty in the output of a mathematical model or system (numerical or otherwise) can be apportioned to different sources of uncertainty in its inputs.
131. A stone weight 500 N in air and 300 N in water.

The volume of the stone is
A. $0.0204 \mathrm{~m}^{3}$
B. $0.204 \mathrm{~m}^{3}$
C. $1.0204 \mathrm{~m}^{3}$
D. $1.0402 \mathrm{~m}^{2}$

Answer ||| A

Solution |||

Weight of stone $=500 \mathrm{~N}$

Effective weight of stone $=300 \mathrm{~N}$

Up thrust on stone $=500 \mathrm{~N}-300 \mathrm{~N}=200 \mathrm{~N}$
$V \times \delta_{w} \times g=200 N$
$V \times 1000 \times 9.8=200 N$

$$
v=\frac{200}{1000 \times 9.8} \Rightarrow 0.0204 \mathrm{~m}^{3}
$$

132.As per IS 1200, in the measurement of brickwork, no deductions shall be made for
A. Opening up to 0.1 sq. $m$ in area
B. Opening up to $0.01 \mathrm{sq} . \mathrm{m}$ in area
C. Opening up to $0.001 \mathrm{sq} . \mathrm{m}$ in area
D. Opening up to 1.0 sq. $m$ in area

Answer ||| A

Solution |||

No deductions shall be made for opening up to 0.1 sq. m in area
133.For estimation of the brick masonry, no deduction is made for the end of the rafter up to the area (square inch) of
A. 50
B. 72
C. 108
D. 44

Answer ||| B

Solution |||

No deduction is made for the following in brick masonry:

1) Opening each up to 0.1 square meter or 1000 cm square.
2) For the end of the rafter up to the area of 0.5 square meter or 500 square cm (approximately 72 inches).
134. Which of the following is the most correct estimate?
A. Plinth area estimate
B. Cube rate estimate
C. Detailed estimate
D. Building cost index estimate

Answer ||| C

Solution ||| detailed estimate is the most accurate estimate after that plinth area estimate is good estimate.
135.In a rectangular channel, the depth of flow is 1.8 m and the specific energy at that section is 2.5 m , the flow is
A. Subcritical
B. supercritical
C. critical
D. not possible

Answer ||| A

Solution |II

Given $\mathrm{y}=1.8 \mathrm{~m}$

Specific energy $E=2.5 \mathrm{~m}$

$$
\begin{aligned}
& E=Y+\frac{V^{2}}{2 g} \\
& 2.5=1.8+\frac{V^{2}}{2 g} \\
& \frac{V^{2}}{2 g}=0.7 m
\end{aligned}
$$

Now,

$$
\begin{aligned}
& F_{r}^{2}=\frac{V^{2}}{g Y} \\
& F_{r}^{2}=\frac{0.7 * 2}{1.8}=0.777 \\
& F_{r}=0.882
\end{aligned}
$$

Hence flow is subcritical.
136. The most accurate method of finding the average depth of rainfall over an area is
A. Isohyetal method
B. Arithmetic mean method
C. Thiessen polygon method
D. All of these

Answer ||| A

Solution |||

According for finding average depth by various methods follows the order:
Arithmetic mean method < Thiessen polygon method<Isohyetal method
137.If the ruling gradient is 1 in 150 on a particular section of broad gauge and at the same time a curve of 4 degree is situated on this ruling gradient, what is the allowable ruling gradient?
A. 1 in 10
B. 1 in 72
C. 1 in 196
D. 1 in 245

Answer ||| C

Solution |||

Given

Ruling Gradient $=\frac{1}{150}$
$D=4$ degree

As per Indian railways, the grade compensation of B.G is $0.04 \%$ per degree of curve

Allowable Ruling Gradient $=\frac{1}{150} \times 100-4 \times 0.04=0.51 \%=\frac{1}{196}$
138. Choose the correct option for figure shown below:

A. Diamond interchange
B. Partial Clover Interchange
C. Full Clover Interchange
D. None of these

Answer ||| A

Solution |||

Diamond Interchange


- Partial Clover Interchange

- Full Clover Interchange

139.For a steel member in tension, the permissible stress in average shear is given by
A. $0.6 f y$
B. $0.66 f y$
C. 0.4fy
D. $0.45 f y$

Answer ||| C

Solution |II

The permissible stress for a steel member is given in the below table-

| Steel member | Permissible stress |
| :--- | :--- |
| In axial tension | $0.6 f y$ |
| In axial compression | $0.6 f y$ |
| In bending | $0.66 f y$ |
| In bearing | 0.75 fy |
| In average shear | 0.4 fy |
| In maximum shear | 0.45 fy |

140.If coefficient of variation of rainfall values at 5 rain Gauges station is 40\% and permissible error in estimation of rainfall is $15 \%$ then additional no of rain gauges required for catchment is
A. 4
B. 3
C. 5
D. 8

Answer ||| B

Solution |||

Coefficient of variation (c.v) $=\frac{\sigma}{\mu} \times 100$
Given $\mathrm{CV} \Rightarrow 40 \varepsilon=15 \% \sigma=$ standard deviation
$\mu=$ mean
No of rain Gauge $=\Rightarrow\left(\frac{\mathrm{cv}}{\varepsilon}\right)^{2}$
$\Rightarrow\left(\frac{40}{15}\right)^{2} \Rightarrow 7.11 \approx 8$

Addition rain gauge required $=8-5=\mathbf{3}$
141.Strainer tube well is unsuitable for-
A. Hard strata
B. Fine sandy strata
C. Coarse gravel
D. Clayey strata

Answer ||| B
Solution |||

Strainer tube well is unsuitable for fine sandy strata because fine sand will clog the pores of the strainer and efficiency of tube well will be affected by it.
142.A tunnel is found more advantageous as compared to the alternate routes because it
A. Remains free from snow
B. Reduces the cost by reducing the route distance
C. Avoids interference with surface rights
D. All of the above

Answer ||| D

Solution |||

Advantage of tunnel as compared to alternate routes are as follows:

1. Tunnel is remains free from show in cold region.
2. It avoids the long circuitous route around a mountain or spur.
3. Due to shortening in distance, tunnel have proved economical.
4. Reduced the cost by reducing the route distance.
5. Tunnel avoid interference with surface rights.
6. Tunnel allow rapid and unobstructed transport facilities in big congested cities.
143.The group index of soil subgrade is 12 . The sub - grade soil is rated as
A. Good
B. Fair
C. Poor
D. Very poor

Answer ||| D

Solution |||

| Type of subgrade | Group index range of subgrade |
| :--- | :--- |
| Good | $0-1$ |
| Fair | $2-4$ |
| Poor | $5-9$ |
| Very poor | $10-20$ |

144.If the crop rice requires about 12 cm depth of water at an average interval of about 15 days and the crop period of the rice is 120 days, the delta for the crop rice will be ?
A. 96 cm
B. 120 cm
C. 150 cm
D. 10.5 cm

Answer ||| A

Solution |||

Water is required at an interval of 15 days for a period of 120 days.

No. of watering $=\frac{120}{15} \Rightarrow 8$

Total depth of water required $=$ no of watering $\times$ depth of water $\Delta$ for rice $\Rightarrow 12$ $\times 8 \Rightarrow 96 \mathrm{~cm}$.
145. What is the value of headlight sight distance for a highway with a design speed of 65 kmph ? (Take $\mathrm{f}=0.36$ and $\mathrm{t}=2.5 \mathrm{sec}$ )
A. 665 m
B. 81.3 m
C. 91.4 m
D. 182.8 m

Answer ||| C

Solution |||

Given
$\mathrm{V}=65 \mathrm{kmph}$
$\mathrm{t}=2.5 \mathrm{sec}$
$f=0.36$

Headlight Sight Distance: It is the distance of the road available under the illumination of headlights of vehicles during nighttime driving. If nothing is given then

Headlight Sight Distance (HSD) = SSD

$$
\begin{aligned}
& S S D=0.278 \times V \times t+\frac{V^{2}}{254 f} \\
& S S D=0.278 \times 65 \times 2.5+\frac{65^{2}}{254 \times 0.36} \\
& S S D=45.175+46.2052 \\
& S S D=91.4 \mathrm{~m}
\end{aligned}
$$

146. Traffic conflicts that may occur in a rotary intersection are?
A. merging and diverging
B. crossing and merging
C. crossing and diverging
D. crossing merging and diverging

Answer ||| A

Solution |II
The crossing conflicts are eliminated in a rotary intersection.
147. Which of the following is the correct statement for length of the long wall as one move from earthwork to brick work in super structure in long and short wall method?
A. Its value decreases
B. Its value depends upon the length of the wall.
C. Its value increases.
D. Its value remains same.

## Answer ||| A

Solution |||

The estimation of building quantities like earth work, foundation concrete, brickwork in plinth and superstructure etc. can be worked out using long wall short wall method.
148. Which of the following soils is transported by gravitational forces?
A. Loess
B. Talus
C. Drift
D. Dune sand

Answer ||| B

Solution |||

| Alluvial soil | Deposited by river water |
| :---: | :---: |
| Lacustrine <br> soil | Deposited by still water like <br> lakes |
| Marine soil | Deposited by sea water |
| Aeolian soil | Transported by wind |
| Glacial soil | Deposited by ice |
| Talus | Gravity Deposits |

149. Which of the following is correct regarding 'STOP' sign?
A. It is hexagonal shape, white boundary and Red background.
B. It is of octagonal shape, white boundary and red background.
C. It is of hexagonal shape, red boundary and white background.
D. It is of octagonal shape, Red boundary and white background.

## Answer ||| B

Solution |II
150.Gram crop has a kor period of 15 days and kor depth of 12 cm . The duty of the gram is
A. 1296 ha/cumec
B. 1080 ha/cumec
C. 1050 ha/cumec
D. 1200 ha /cumec

## Answer ||| B

Solution III

$$
\begin{aligned}
& \operatorname{Duty}(\mathrm{D})=\frac{8.64 \mathrm{~B}(\text { day })}{\Delta(\mathrm{m})} \\
& =\frac{8.64 \times 15}{0.12} \Rightarrow 1080 \mathrm{ha} / \mathrm{cumec}
\end{aligned}
$$

